

FOOD STORING OF RED-BELLIED WOODPECKERS

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RED-BELLIED Woodpeckers (*Centurus carolinus*) store food to a varying extent the year around, but the habit is most pronounced in fall months when the storing and re-storing of berries and acorns may occupy a good deal of their time, as I have observed over the course of eight years in the vicinity of Seneca, Maryland. It is not always apparent under field conditions what these woodpeckers are actually doing. Observations on the manner of storage, in which the tongue is used with considerable skill, have been aided by six Red-bellied Woodpeckers which I have raised by hand and maintained in an aviary.

FIELD OBSERVATION

C. carolinus frequently stores poison ivy (*Rhus radicans*) berries during the fall, as illustrated by an observation made on 13 October 1957. A female would pick 2 to 7 berries while clinging upside down on a cluster, then fly out to several different storage trees. An old willow was visited with particular frequency. Its trunk was encircled by a poison ivy vine attached to the bark by masses of matted rootlets. The woodpeckers stored numerous berries under these rootlets. On 24 October 1960, I watched a male working in a similar manner for eight minutes. This individual perched on a branch as it reached out repeatedly to seize berries, then pushed them into nearby crevices. He didn't swallow any until about to fly away. The above episodes illustrate the fact that *C. carolinus* usually uses storage places which are readily available and require no excavation.

Acorns may be handled differently from small berries if they have to be hammered into small pieces. Pin oak (*Quercus palustris*) acorns are small enough to be stored directly. Thus, on 18 October 1958, I watched a male fly against a cluster of pin oak leaves, pick an acorn, swoop down to a dead stub, and then hammer the acorn into a hole, only to pull it out and lodge it in another place before flying back to the oak. This pattern of behavior was similar to that described elsewhere for Red-headed Woodpeckers (*Melanerpes erythrocephalus*) (Kilham, 1958). *C. carolinus* may fly hundreds of yards to pick an acorn, then bring it back for storage. One captive individual had a peculiar habit of spearing extra large acorns in order to fly with them. Brooks (1934) has described a similar situation for *M. erythrocephalus*, one of which starved to death when unable to extricate its bill.

C. carolinus appears to have knowledge of where stores are hidden, a knowledge which is doubtless reinforced by habits of re-storing. On 25 December

1953, I was standing in an open pasture when one of these woodpeckers alighted on a nearby fence, pulled out an acorn, then stored it again in an adjacent post. The nearest tree was 100 yards away.

Territorialism.—Red-bellied Woodpeckers occupy individual areas after separation of family groups, parents and young, in September (Kilham, 1961). In the course of successive week-end visits, during fall and winter months from 1957 through 1960, I always found a male in one part of Creek Wood, with two females occupying adjacent areas on either side. The individual areas were three to four acres in extent, as judged by the usual flights of the birds occupying them. By way of contrast, the four acres comprising the actual extent of Creek Wood had contained the winter storage territories of 12 Red-headed Woodpeckers in 1956-57 (Kilham, 1959).

Relations with other birds.—While *M. erythrocephalus* was continually aggressive in driving a variety of birds from its territories, *C. carolinus* usually appeared indifferent to the presence of potential competitors for food stores, such as Blue Jays (*Cyanocitta cristata*) and Downy Woodpeckers (*Dendrocopos pubescens*). On 16 November 1957, for example, I noticed a jay working on a rotten stub. A male *C. carolinus* flew over, replaced the jay, then took out a morsel of food and flew to re-store it in another place. He made four successive trips to bring away stores from the stub, paying no attention to the jay which remained close by. I witnessed a similar episode in relation to a Downy Woodpecker on 12 December 1953. The smaller woodpecker rested only three feet away. Reasons why *C. carolinus* may be successful at storing food are presented in a final discussion. It should be said, however, that Pileated Woodpeckers (*Dryocopus pileatus*) are possibly the only birds which are able to reach the deep-lying stores of Red-bellied Woodpeckers with any regularity. I have noted *D. pileatus* investigating likely storage places on repeated occasions. Thus, on 10 January 1960, a Pileated Woodpecker had been feeding for five minutes in a natural depression in a sycamore limb when a Red-bellied Woodpecker flew up and waited several minutes within a foot of the larger bird. There was no excitement. I had opportunities to observe similar events in the aviary, where a Pileated had obviously learned to visit places used by a captive Red-bellied Woodpecker for storing food.

Interspecific conflicts.—Although *C. carolinus* is generally unaggressive during fall and winter months, it may have occasional conflicts, particularly with Starlings (*Sturnus vulgaris*) and with Yellow-bellied Sapsuckers (*Sphyrapicus varius*). A woodpecker will not infrequently attack and drive a Starling away from a suet holder. Conflicts with more variable outcome were observed on three occasions when a *C. carolinus* was getting sap from sapsucker holes on favorable days. I have seen a *C. carolinus* drive a sapsucker away from its drill holes as early as 25 December. On 22 February 1958,

however, I saw a sapsucker attack a Red-bellied Woodpecker which had come to feed on sap from a pin oak. The two birds grappled and fell to the ground. The woodpecker then flew away. Another encounter took place on 4 April 1957, when a sapsucker, which had been drilling fresh holes in a maple, dropped downward to attack a Red-bellied Woodpecker feeding on sap. Results were rather surprising, for the woodpecker, in striking back, was able to seize the sapsucker in its bill, by the back of the neck, and to hold its victim dangling helplessly for a few moments. The sapsucker then flew away, apparently unhurt. Both birds could have felt possessive about the maple which was situated in the center of the woodpecker's winter area as well as being one in which the sapsucker had done much drilling in preceding months.

OBSERVATIONS ON CAPTIVE BIRDS

Use of tongue.—Observations on six genera of woodpeckers kept in an indoor aviary made it apparent that the various species used their tongues in different ways for different purposes. The tongue of *C. carolinus* was relatively long and protrusible. While not as long as those of *D. pileatus* or Yellow-shafted Flicker (*Colaptes auratus*), it appeared to function more adroitly in maneuvering objects at a distance, within crevices. Neither *S. varius* nor the *M. erythrocephalus* had any such long-distance control. A tame female Red-bellied Woodpecker would put her bill through the wire of the aviary, within a foot of my face, to retrieve a morsel of bread placed several inches away. The tip of the tongue, which extended 1 to 1½ inches beyond the tip of her bill, always went over and to the back of the object, starting it to jiggle toward the wire by means of a rapid back and forth motion. This skill in manipulation could also operate in vertical crevices. On one occasion, a male *C. carolinus* flew across the aviary with a piece of bread crust which he dropped down the split of an upright post. His subsequent behavior was somewhat amusing to watch (Fig. 1). Thus, he would thrust his bill down the crevice and make the crust dance like popcorn in a popper as he worked it upward with his long tongue, only to let it fall and try the operation over again. Figure 2 shows one of these woodpeckers storing food under more usual circumstances. It is obvious that a field observer will find it nearly impossible to discover what such a bird is doing when the tip of its tongue and bill are buried from view.

Storage of miscellaneous objects.—The captive *C. carolinus* often stored miscellaneous objects of no apparent value. When I gave one female a bent, 3-inch nail, she spent five minutes trying to insert it into various holes, hunching her shoulders forward as she did so. Toothpicks, clips, or even small wads of paper elicited similar behavior. The woodpeckers would also store objects of their own, particularly a male, which would sometimes loosen a sliver of



FIG. 1. Captive Red-bellied Woodpecker using tongue to recover piece of bread from vertical cleft.

wood several inches long, arrange it to point straight forward in his bill, then fly over the aviary in search of a storage place. This same male was preparing to store another and smaller chip on 6 April 1960, when his mate



FIG. 2. Two positions of a Red-bellied Woodpecker storing an acorn. Action of tongue not apparent under field conditions.

flew up, took the chip in her bill, and flew off with it. The nesting of this pair has been described elsewhere (Kilham, 1961).

Hunching of shoulders.—All of the species of woodpecker maintained in the aviary, with exception of *D. pileatus*, had a similar method of preventing bits of food from falling to the ground, whether their aim was to store or to hammer the morsels into pieces which could be swallowed. This consisted in pushing the belly flat against the tree trunk, while rounding their shoulders forward. The hunched shoulders were surprisingly agile in guiding bits of acorn or of dismembered insect, so that they were trapped against the belly where the woodpecker could retrieve them. This maneuver, as performed by the Great Spotted Woodpecker (*Dendrocopos major*), has been filmed by Sielmann (1958).

Use of tongue in locating prey.—*C. carolinus* spends almost no time excavating holes when in search of grubs and other prey, but appears to accomplish the same objective by using bill and tongue to explore natural crevices. When I brought rotting logs from the woods to the aviary, the Pileated, Downy, and Hairy (*Dendrocopos villosus*) Woodpeckers, as well as the Yellow-shafted Flicker, and to a lesser extent, the sapsuckers, were immediately interested and each began pecking or hewing, in its individual style, to get ants,



FIG. 3. Red-bellied Woodpecker exploring rotten log with long tongue in search of grubs. (Adapted from high-speed photographs taken in aviary.)

termites, or whatever might turn up. The strategy of *C. carolinus* was effective in this competitive situation. As illustrated in Fig. 3, this species explored the logs with its tongue, occasionally twisting its head upside down to do so. In this manner it sometimes pulled out beetle larvae 1-2 inches long before any of the other woodpeckers had dislodged prey of any size. It may be that the tongue-probing of *Centurus*, in contrast to pecking and hewing methods, enables it to come upon its victims quickly and without disturbance.

COMPARISONS WITH OTHER SPECIES

The food storing of *C. carolinus* depends on an ability to manipulate objects at a distance with its tongue and thus lodge and retrieve morsels deep within crevices, behind bark, or at the broken ends of branches, beyond reach of its usual food competitors, which include Tufted Titmice (*Parus bicolor*), White-breasted Nuthatches (*Sitta carolinensis*), and Blue Jays. Four other species of woodpeckers lodged food in the indoor aviary. These were the Yellow-bellied Sapsucker, and the Downy, Hairy, and Red-headed Woodpeckers, the latter species having been the only one to store food in any persistent manner. None of the four species displayed a lingual agility comparable to that described above for *Centurus*. Although *Centurus* and *Melanerpes* are closely related genera and may inhabit the same areas in fall and winter months (Kilham, 1959), their methods of storing and protecting stored food offer points of contrast which are summarized in Table 1.

TABLE 1
 CONTRASTING FALL AND WINTER BEHAVIOR OF RED-BELLIED AND RED-HEADED WOODPECKERS

	<i>C. carolinus</i>	<i>M. erythrocephalus</i>
Method of hiding stores	Manipulated into deep crevices with long tongue	Sealed in with slivers of damp wood or other material
Excavation of holes for storage	None, uses natural cavities	May enlarge natural cavities or dig pits for separate acorns, etc.
Aggressiveness vs. rivals for stores	None observed	Very aggressive to all rivals, inter- and intra-specific
Aggressiveness vs. other rivals	May attack Starlings at suet or sapsuckers at drill holes	Tolerant when feeding with sapsuckers
Territorial behavior (non-breeding)	Occupies individual areas, 3 to 4 acres in extent; boundary disputes not observed	Small, sharply defined individual territories; boundary disputes common
Migratory habits	None; much the same areas winter and summer	Mobile opportunities; may overwinter in numbers in localities with unusually heavy acorn or other crops

The habit of storing miscellaneous objects is peculiar to several species. A male Yellow-bellied Sapsucker, for example, tried to store a chip of wood in six different holes in the aviary before finding one that was suitable. Three genera of woodpeckers, *Sphyrapicus*, *Centurus*, and *Melanerpes*, have thus been observed in this performance. *M. erythrocephalus*, however, is apparently the only one to have developed the practice into a regular habit by which it seals its acorns and other winter food into cavities in an apparent effort to hide them from various predators (Kilham, 1958).

Storage of miscellaneous objects has also been described for Acorn Woodpeckers (*Melanerpes formicivorus*). Ritter (1921) gave his opinion of the habit in this species by stating that "the [storing] instinct sometimes goes wrong to the extent of storing pebbles instead of acorns, thus defeating entirely the purpose of the instinct." It is not always easy, however, to perceive the purpose of what animals are doing. "Play," for example, may not be a case of "instincts" gone wrong so much as a way of developing and practicing skills against a time when an animal may need them for survival. Storage of odd objects could be a form of "play" which is developmental in the life histories of woodpeckers. A further interpretation might be that the behavior

exemplified response to subnormal stimuli because of high specific action potentials for storage in a situation where storable food was available in only limited amounts.

SUMMARY

Red-bellied Woodpeckers are skillful in lodging and removing bits of food from storage places 2 to 3 inches deep within natural crevices by use of their long tongues. The depth of this storage appears to give protection against jays, titmice, and other competitors. Storing is done particularly in the fall. Red-bellied Woodpeckers occupy individual areas three to four acres in extent at this season and are unlike the related Red-headed Woodpecker in being unaggressive in relation to stored food. Field observations were aided by observations on hand-raised individuals maintained in an aviary. Extraction of insect larvae from rotten logs, storage of miscellaneous objects, and other activities in which the tongue was used are described.

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